

The seal of the State of South Dakota is a circular emblem. It features a central illustration of a landscape with a river, a windmill, and a small settlement. Above the illustration is a banner with the motto "UNDER GOD THE PEOPLE RULE". The outer ring of the seal contains the text "STATE OF SOUTH DAKOTA" at the top and "GREAT SEAL" at the bottom, separated by two stars. The year "1889" is inscribed at the bottom of the seal.

Statement of Basis

Title V Air Quality Operating Permit Renewal

**Prairie Ethanol, LLC d/b/a
POET Biorefining - Mitchell**

Mitchell, South Dakota

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1.0 Background

On August 15, 2006, the South Dakota Department of Environment and Natural Resources (DENR) issued Prairie Ethanol's initial Title V air quality operating permit to produce up to 66 million gallons of undenatured ethanol per year and associated dried distiller grain and solubles (DDGS) as a saleable byproduct.

The following revisions were made to the Title V air quality operating permit:

1. On December 8, 2006, Prairie Ethanol's permit was modified to change short-term nitrogen oxide limits for Unit #8, #12 and #13, add operational restrictions to Unit #12 and #13, change operational restrictions on Unit #14 and adding Unit #23. The company's address, facility contact, and responsible official were also updated.
2. On April 16, 2007, DENR issued a minor permit amendment for the installation of three new corrugated steel grain storage bins associated with Unit #1.
3. On August 4, 2008, Prairie Ethanol's permit was modified to increase the ethanol production limit from 66 to 76 million gallons per year of undenatured ethanol.

On February 7, 2011, Prairie Ethanol submitted an application to renew the existing Title V air quality operating permit. The application was considered complete on March 4, 2011.

1.1 Existing Equipment

Table 1-1 provides a list of the units presently permitted which was taken from the current Title V air quality operating permit issued August 4, 2008.

Table 1-1 – Description of Permitted Units, Operations, and Processes

Unit	Description	Maximum Operating Rate	Control Device
#1	Grain receiving, grain transfer via enclosed conveyor belt systems, and storage bin loading. Trucks and railcars transport grain to the ethanol plant and dump grain into a receiving pit located in a partially enclosed building. Elevator legs transport the grain from the receiving pit to five grain storage bins.	840 tons of grain per hour	Baghouse
	Elevator legs transport dried distillers grain from a storage silo to load out stations. The dried distillers grain is loaded into trucks and railcars.	220 tons of dried distillers grain per hour	
#2	Grain cleaning and grain transfer. The grain will be transferred from the grain storage bins to a grain scalper.	140 tons of grain per hour	Baghouse

Unit	Description	Maximum Operating Rate	Control Device
#3	Grain milling. The cleaned grain is transferred to a hammer mill.	22 tons of grain per hour	Baghouse
#4	Grain milling. The cleaned grain is transferred to a hammer mill.	22 tons of grain per hour	Baghouse
#5	Grain milling. The cleaned grain is transferred to a hammer mill.	22 tons of grain per hour	Baghouse
#6	Grain milling. The cleaned grain is transferred to a hammer mill.	22 tons of grain per hour	Baghouse
#7	Fermentation system. Ethanol is produced from the fermentation process. The fermentation process occurs in five fermenters and the liquid beer is stored in a beer well prior to the distillation process.	207 tons of mash per hour	Wet scrubber. The exhaust gases from the wet scrubber are passed through the regenerative thermal oxidizer (Unit #8) but may bypass the regenerative thermal oxidizer under the terms of this permit.
	Distillation process. The distillation process distills the liquid beer. The distillation process consists of the beer stripper, rectifier, side stripper, molecular sieve, and evaporators.	43,200 gallons of beer per hour	
#8	DDGS dryers. The distillers grain and solubles are dried in two ring dryers operated in series. Each dryer has a multi-cyclone to collect product and is fired on natural gas.	Each dryer has a heat input capacity of 60 million Btus per hour and processes 23 tons of DDGS per hour.	A regenerative thermal oxidizer. The thermal oxidizer has a maximum operating rate of 30 million Btus per hour heat input.
	The thin stillage and solids fractions of the wet distillers grain and solubles are separated by four centrifuges.	Each centrifuge processes 50 tons of whole stillage per hour.	
	Fermentation and Distillation Process (Unit #7).		
#9	A fluid bed cooler. The fluid bed cools the dried distillers grain.	23 tons of dried distillers grain per hour	Baghouse. A portion of the exhaust gases may be passed through the DDGS dryer(s) in Unit #8
#10	Dried distillers grain silo.	23 tons of dried distillers grain per hour	Baghouse
#11	Dried distillers grain silo bypass.	23 tons of dried distillers grain per hour	Baghouse

Unit	Description	Maximum Operating Rate	Control Device
#12	Boiler #1. A steam boiler fired with natural gas. The boiler is equipped with low NOx burners.	143 million Btus per hour heat input	Not applicable
#13	Boiler #2. A steam boiler fired with natural gas. The boiler is equipped with low NOx burners.	143 million Btus per hour heat input	Not applicable
#14	Generator. A diesel generator fired on distillate oil.	2000 kilowatts	Not applicable
#15	An industrial cooling tower with three cells.	Not applicable	Not applicable
#16	A submerged truck loading rack.	39,000 gallons of denatured ethanol per hour.	A flare. The flare has an operating rate of 6.4 million Btus per hour heat input
	A rail car loading rack.	150,000 gallons of denatured ethanol per hour.	
#18	Tank #1 – An aboveground storage tank with an internal floating roof. The tank will store ethanol.	250,000 gallons	Not applicable
#19	Tank #2 – An aboveground storage tank with an internal floating roof. The tank will store ethanol.	250,000 gallons	Not applicable
#20	Tank #3 – An aboveground storage tank with an internal floating roof. The tank will store denatured ethanol.	1,500,000 gallons	Not applicable
#21	Tank #4 – An aboveground storage tank with an internal floating roof. The tank will store denatured ethanol.	1,500,000 gallons	Not applicable
#22	Tank #5 – An aboveground storage tank with an internal floating roof. The tank will store gasoline.	126,000 gallons	Not applicable
#23	Grain milling. The cleaned grain is transferred to a hammer mill.	22 tons of grain per hour	Baghouse

1.2 Proposed Changes

In its 2011 renewal application, Prairie Ethanol requested the following revisions to the existing permit:

1. Inclusion of the New Source Performance Standard under 40 Code of Federal Regulation (CFR), Part 60, Subpart VVa, Standard of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals manufacturing Industry for Which Construction,

Reconstruction, or Modification Commenced after November 7, 2006. Prairie Ethanol is currently subject to 40 CFR Part 60, Subpart VV.

2. Inclusion of stack testing methodology to determine compliance with volatile organic compound (VOC) emission limits. POET entered into a consent decree with EPA Region 8 regarding another POET biorefinery located in South Dakota. As part of the consent decree, EPA is requiring POET to request a permit modification at its facilities to clarify the required test methodology when determining compliance with applicable volatile organic compound emission limits. POET is requesting the following permit language be included in the permit renewal regarding stack testing requirements:
 - a. Required Test Methods. The owner or operator shall conduct all volatile organic compound mass emission performance tests in accordance with 40 CFR Part 51, Appendix M, Method 207 and 40 CFR Part 60, Appendix A, Method 18;
 - b. Treatment of 2,3-Butanediol. Due to difficulties associated with appropriate method detection limit, 2,3-Butanediol will be sampled through the chromatography column approximately 2.5 times faster than the maximum allowable sampling rate for the other volatile organic compound in the sampling program (e.g. acetaldehyde, acrolein, and ethyl acetate). This requirement applies only if the Method 207 results indicate that 2,3-Butanediol should be sampled as part of the Method 18 testing;
 - c. Treatment of Non-Detects. When summing analytes per Method 18, non-detect data will be included in the total volatile organic compound mass as one half of the compound method detection limit; except that, if all three performance test runs result in a non-detect measurement and the method detection limit is less than or equal to 1.0 part per million by volume on a dry basis, then all such non-detect data will be treated as zero.
3. Remove the term “emergency” when referencing the generator (Unit #14) in permit condition 5.3, 5.4, and 6.8. In all other cases, Unit #14 is identified as just a generator. POET is not proposing any changes to the limit in permit condition 7-13 which restrict operation of the generator to less than or equal to 350 hours per 12-month rolling period.
4. The current permit identifies in Table 1-1 that there are four fermenters. Prairie Ethanol requests this number be corrected to refer to five fermenters or state there are multiple fermenters.
5. Prairie Ethanol is requesting the daily maximum operating rate for Unit #7 be updated to 48,600 gallons per hour of beer per hour. On August 4, 2008, Prairie Ethanol’s permit was modified to increase the ethanol production limit from 66 to 76 million gallons per year of undenatured ethanol. Prairie Ethanol stated that as part of this increase in the annual production rate, the hourly rate was also increased.
6. The unit description for Unit #8 states the two dried distiller grains and solubles dryers are operated in series. Prairie Ethanol requested this be corrected to state the two dryers can be operated either in series or parallel and asks the description be corrected accordingly.

1.2.1 Revise Number of Fermenters

Prairie Ethanol requested the description of the number of fermenters in Table 1-1 be changed from four fermenters to five fermenters or just multiple fermenters. Prairie Ethanol indicated the plant was original built with five fermenters. In addition, Prairie Ethanol is requesting the daily

maximum operating rate for Unit #7 be updated to 48,600 gallons of beer per hour which is related to the increase in production capacity Prairie Ethanol applied for in August 2008.

DENR reviewed the initial application submitted by Prairie Ethanol on May 13, 2005. The original application identified four fermenters would be constructed. Subsequent applications to revise the initial permit did not include any changes to the number of fermenters. This includes the August 1, 2008, application in which Prairie Ethanol requested an increase in the ethanol production limit from 66 to 76 million gallons of undenatured (anhydrous) ethanol per year. Prairie Ethanol stated in this application "...that no physical changes or new equipment will be required to achieve this increase production. The increase in production will be achieved through process optimization."

It is possible the fifth fermenter could add to the increase in Prairie Ethanol's production capacity and corresponding increase in beer production. However, DENR treated all changes to the permit as a permit modification except for one in which Prairie Ethanol installed three enclosed grain storage bins. The transfer of grain to the storage bins was routed to an existing baghouse and Prairie Ethanol did not request an increase in the particulate matter short term limit. Therefore, DENR considered the revision a minor permit amendment. By treating the increase in production capacity as a permit modification, the change was public noticed and all parties involved were aware of the changes. After reviewing the applicable state and federal regulations, the addition of the fifth fermenter does not change any state or federal requirements.

In addition, the exhaust gases from the wet scrubber controlling emissions from the distillation and fermentation processes are passed through the regenerative thermal oxidizer (Unit #8). Unit #7, the fermentation and distillation system and #8, the regenerative thermal oxidation unit, were tested in 2007, and demonstrated compliance with the emission limits for both units.

DENR will revise the number of fermenters to five and will increase the limit on the amount of beer that can be produced to 48,600 gallons per year.

1.2.2 Revising Unit #8 Description

Prairie Ethanol is requesting the description of Unit #8 reflect the two dried distillers grains and solubles dryers may be operated in series or parallel. In either operating scenario, the dryers vent to a multi-cyclone, air emissions are controlled by a regenerative thermal oxidizer, and equipment downstream of the dryers restricts the maximum capacity to 23 tons of dried distiller grain and solubles per hour. DENR will make this change to the unit description.

2.0 New Source Performance Standards

DENR reviewed the New Source Performance Standards listed in 40 CFR Part 60 to determine if any of the federal New Source Performance Standards are applicable to this facility. The following may be applicable.

2.1 Standards for Grain Elevators

The provisions under 40 CFR Part 60, Subpart DD are applicable to the following grain elevators:

1. The provisions of this subpart are applicable to any grain terminal elevator, which has a permanent grain storage capacity of 2,500,000 bushels. A grain terminal storage elevator means any grain elevator except those located at animal food manufacturers, pet food manufactures, cereal manufacturers, breweries, and livestock feedlots; or
2. The provisions of this subpart are applicable to any grain storage elevator, which has a permanent grain storage capacity of 1,000,000 bushels. A grain storage elevator means any grain elevator located at any wheat flour mill, wet corn mill, dry corn mill (human consumption), rice mill, or soybean oil extraction plant; and
3. Commences construction, modification, or reconstruction after August 3, 1978.

Prairie Ethanol is considered a grain terminal elevator. The installation of the three grain storage bins in 2007 makes the permanent grain storage capacity for this plant greater than 2,500,000 bushels; therefore, Prairie Ethanol must comply with this new source performance standard.

In accordance with 40 CFR § 60.300(a), the affected operations at the ethanol plant are each unloading, loading, grain dryer, and all grain handling operations. This affects the following operations:

- Unit #1 – Receiving; and
- Grain Bin #3, #4, and #5.

The new grain handling conveyors that Prairie Ethanol installed are part of a totally enclosed system with no vents. Unit #1 is applicable because the proposed conveyor systems will be aspirated to the baghouse associated with Unit #1. In accordance with 40 CFR § 60.302(b), emissions from the baghouse associated with Unit #1 shall not exceed the corresponding process emission limits:

1. 0.01 grains per dry standard cubic foot; and
2. 0% opacity.

In addition, in accordance with 40 CFR § 60.302(c), fugitive dust emissions from the following operations shall not exceed the corresponding opacity limit:

1. Any individual truck unloading station, railcar unloading station, or railcar loading station, which exhibits greater than 5% opacity;
2. Any grain handling operation which exhibits greater than 0% opacity; and
3. Any truck loading station which exhibits greater than 10% opacity.

The three new grain bins that Prairie Ethanol installed will be vented to the baghouse associated with Unit #1. These grain bins are also equipped with vents that allow for the possibility of fugitive dust. Therefore, they must meet the 0% opacity grain handling limit.

2.2 Standards Applicable to Boilers

There are three New Source Performance Standards for fossil fuel-fired steam generators. The three standards are applicable to the following steam generators:

1. 40 CFR Part 60, Subpart D: applicable to a steam generator with a maximum operating rate of 250 million Btus per hour or more and commenced construction after August 17, 1971;
2. 40 CFR Part 60, Subpart Db: applicable to a steam generator with a maximum operating rate of 100 million Btus per hour or more and commenced construction after June 19, 1984; and
3. 40 CFR Part 60, Subpart Dc: applicable to a steam generator with a minimum design heat input capacity equal to or greater than 10 million Btus per hour but less than or equal to 100 million Btus per hour and commenced construction after June 9, 1989.

Both boilers were constructed after June 19, 1984 and have a heat input capacity greater than 100 million Btus per hour. Therefore, Prairie Ethanol two boilers are subject to 40 CFR Part 60, Subpart Db.

In accordance with §60.40b(j), an affected unit that is subject to subpart Db and commences construction, modification, or reconstruction after June 19, 1986 is not subject to 40 CFR Part 60, Subpart D. Prairie Ethanol is not subject to 40 CFR Part 60, Subpart Dc because the two boilers have heat input ratings greater than 100 million Btus per hour.

Prairie Ethanol does not have to meet sulfur dioxide or particulate emission limits associated with subpart Db because those standards are associated with the burning of coal, oil, wood, etc. Prairie Ethanol will have to meet the nitrogen oxide limit and associated requirements in subpart Db while operating the boilers. In addition, Prairie Ethanol will have to meet the applicable general requirements in 40 CFR Part 60, Subpart A.

2.3 Standards Applicable to Storage Tanks

There are three New Source Performance Standards for storage vessels. The three standards are applicable to the following storage vessels:

1. 40 CFR Part 60, Subpart K: applicable to storage vessels for petroleum liquids capable of storing greater than 40,000 gallons and commenced construction after June 11, 1973 but prior to May 19, 1978;
2. 40 CFR Part 60, Subpart Ka: applicable to storage vessels for petroleum liquids capable of storing greater than 40,000 gallons and commenced construction after May 18, 1978; and
3. 40 CFR Part 60, Subpart Kb: applicable to storage vessels for volatile organic liquids capable of storing 75 cubic meters (approximately 19,813 gallons) or greater and commenced construction after July 23, 1984.

All six tanks commenced construction after July 23, 1984. Therefore, subpart K and Ka are not applicable. See Table 2-1 for tank size and the true vapor pressure of the liquids being stored in the tanks.

Table 2-1 – Tank and Volatile Organic Liquid Specifications

Tank	Capacity	True Vapor Pressure	
	Gallons	Cubic meters	Kilo Pascal
#1	250,000	946	5.4
#2	250,000	946	5.4
#3	1,500,000	5,678	5.5
#4	1,500,000	5,678	5.5
#5	126,000	477	35
#6	1,000	4	0.6

The capacities of Tank #1, #2, #3, #4, and #5 are all greater than 40 cubic meters. Therefore, Tank #1, #2, #3, #4, and #5 are subject to subpart Kb. Tank #6 is less than 40 cubic meters and is not subject to this subpart.

The capacity of Tank #1, #2, #3, #4, and #5 are greater than 151 cubic meters. The maximum true vapor pressure of the tanks is greater than 5.2 kilo Pascal (kPa) and less than 76.6 kPa. Therefore, Tank #1, #2, #3, #4 and #5 must meet all requirements of this subpart and the notification requirements in 40 CFR § 60.7. Based on the application, Prairie Ethanol is installing a fixed roof with an internal floating roof on Tank #1, #2, #3, #4 and #5. Therefore, the permit conditions will be specific to the requirements for a fixed roof with an internal floating roof.

The requirements include maintaining records of the size and dimension of the storage tanks, specific requirements for the tank cover, type of volatile organic liquid stored, period of storage, and maximum true vapor pressure of the volatile organic liquid during the storage period. Prairie Ethanol will also have to meet the applicable general requirements in 40 CFR Part 60, Subpart A.

2.4 Standards for Synthetic Organic Chemical Manufacturing

There are two New Source Performance Standards for synthetic organic chemical manufacturing industries. The two standards are applicable to the following:

1. 40 CFR Part 60, Subpart VV is applicable to affected facilities in the synthetic organic chemical manufacturing industry, of which ethanol is included; and commence construction, reconstruction or modification after January 5, 1981, but before November 8, 2006 and the capacity of the plant is more than 1,000 megagrams per year of ethanol; and
2. 40 CFR Part 60, Subpart VVa is applicable to affected facilities in the synthetic organic chemical manufacturing industry that commence construction, reconstruction, or modification after November 7, 2006 and the capacity of the plant is more than 1,000 megagrams per year of ethanol.

It has already been determined in previous reviews that Prairie Ethanol is subject to 40 CFR Part 60, Subpart VV. This subpart is applicable because construction commenced after January 5, 1981, and the capacity of the plant is more than 1,000 megagrams per year of ethanol.

Prairie Ethanol requested that DENR require its operations to meet the requirements under 40 CFR Part 60, Subpart VVa. DENR compared the requirements between the two subparts and determined that subpart VVa is more stringent. Therefore, DENR will only include the requirement from VVa.

2.5 Standards for Generators

The provisions of 40 CFR Part 60, Subpart IIII are applicable to owners and operators of stationary compression ignition (CI) internal combustion engines (ICE) that meet one of the following:

1. Manufacturers of stationary CI ICE with a displacement of less than 30 liters per cylinder where the model year is 2007 or later for engines that are not fire pump engines or model year 2008 or later for engines that are fire pump engines;
2. Owners or operators of stationary CI ICE that commence construction after July 11, 2005 where the CI ICE is manufactured after April 1, 2006 and is not a fire pump engine or manufactured as a certified National Fire Protection Association fire pump engine after July 1, 2006; or
3. Owners or operators of stationary CI ICE that modified or reconstructed their stationary CI ICE after July 11, 2005.

Prairie Ethanol operates a Caterpillar, Model 3516B, 2,000 kilowatt (2,680 horsepower) generator. The generator has a displacement of 69 liters and 16 cylinders which equates to 4.3 liters per cylinder. According to the manufacturer, the unit was ordered (e.g., commenced construction) by Prairie Ethanol on October 5, 2005 and construction was completed on May 2, 2006. Therefore, the unit is subject to the requirements of this subpart.

Initially, Prairie Ethanol requested the term “emergency” associated with the generator in permit conditions 5.3, 5.4, and 6.8 be removed because it is not used just for emergencies. Prairie Ethanol has an agreement with an electric supply company to use the generator for additional power during peak demands which means the generator is a nonemergency generator.

The change in status from “emergency” use to “nonemergency” or vice versa does not affect the emission limits. 40 CFR § 60.4204(a) states “Owners and operators of pre-2007 model year non-emergency stationary CI ICE with a displacement of less than 10 liters per cylinder must comply with the emission standards in Table 1...” In addition, 40 CFR § 60.4205(a) states “Owners and operators of pre-2007 model year emergency stationary CI ICE with a displacement of less than 10 liters per cylinder that are not fire pump engines must comply with the emission standards in Table 1...” The requirements in Table 1 of 40 CFR Part 60, Subpart IIII applicable to this generator are identified in Table 2-2.

Table 2-2 – Emission Standards for Generators (grams per horsepower-hour)

Maximum Engine Power	HC	NO_x	CO	PM
KW>560 (HP>750)	1.0	6.9	8.5	0.40

Emission data supplied by the engine manufacture indicated that the generator would exceed the EPA's Tier I emissions levels for NO_x identified in Table 2-2. The submitted information indicated that the NO_x emissions were 7.92 grams/horsepower-hour. DENR required Prairie Ethanol to conduct stack emissions testing on the generator. Stack testing was conducted on July 6, 2011 and the NO_x emissions were 6.5 grams/horsepower-hour.

On July 11, 2011, Prairie Ethanol requested that the generator be classified as an emergency generator – the contract with the REA would not be renewed later that year.

Prairie Ethanol's permit will continue to contain federally enforceable permit conditions that will restrict operation of the generator to less than 350 hours per 12-month rolling period. In addition, the requirements in this subpart are similar for emergency and nonemergency generators.

DENR will continue to classify the generator as an emergency generator and include applicable requirements in the permit.

2.6 Other Applicable New Source Performance Standards

DENR reviewed the other New Source Performance Standards and determined there are no other standards applicable to Prairie Ethanol.

3.0 New Source Review

In accordance with ARSD 74:36:10:01, the new source review regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. This facility is located near Loomis, South Dakota, which is in attainment or unclassifiable for all the criteria air pollutants regulated under the Clean Air Act. Therefore, Prairie Ethanol is not subject to new source review.

4.0 Prevention of Significant Deterioration

A prevention of significant deterioration (PSD) review applies to new major stationary sources and major modifications to existing major stationary sources in areas designated as attainment under Section 107 of the Clean Air Act for any regulated air pollutant. The following is a list of regulated air pollutants under the PSD program:

1. Total suspended particulate (PM);
2. Particulate with a diameter less than or equal to 10 microns (PM₁₀);
3. Particulate with a diameter less than or equal to 2.5 microns (PM_{2.5});

4. Sulfur dioxide (SO₂);
5. Nitrogen oxides (NO_x);
6. Carbon monoxide (CO);
7. Ozone – measured as volatile organic compounds (VOCs);
8. Lead;
9. Fluorides
10. Sulfuric acid mist;
11. Hydrogen sulfide;
12. Reduced sulfur compounds;
13. Total reduced sulfur; and
14. Greenhouse gases (carbon dioxide, methane, nitrous oxide, etc.).

If the source is considered one of the 28 named PSD source categories listed in Section 169 of the federal Clean Air Act, the major source threshold is 100 tons per year of any regulated air pollutant, except for greenhouse gases. The major source threshold for all other sources is 250 tons per year of any regulated air pollutant, except for greenhouse gases.

The Environmental Protection Agency (EPA) recently published and implemented a final rule that no longer lists ethanol plants as a chemical manufacturing plant. Therefore, Prairie Ethanol is not classified as a chemical manufacturing plant or one of the 28 listed source categories for PSD regulations and the major source threshold is 250 tons per year, except for greenhouse gases.

According to the Clean Air Act, once a pollutant is regulated under any part of the Act, (as was the case with greenhouse gas emissions after the motor vehicle regulations were finalized in March 2010) major new sources or major modifications are subject to the PSD program and Title V air quality operating permit program. Under the Clean Air Act, PSD and Title V air quality operating permits are required for all sources that emit a regulated air pollutant above 100 or 250 tons per year, depending on the source. This threshold, if applied to greenhouse gases, would greatly increase the number of facilities requiring a PSD review or Title V air quality operating permit. Based on administrative necessity, EPA increased these thresholds through the “Tailoring Rule.”

On May 13, 2010, EPA issued the final version of the “Tailoring Rule” for greenhouse gas emissions. The major source threshold for greenhouse gases is listed below:

1. New PSD source because of a criteria air pollutant, the major source threshold for greenhouse gases is 75,000 tons per year of carbon dioxide equivalent or more;
2. New PSD source if greenhouse gas emissions are 100,000 tons per year of carbon dioxide equivalent or more;
3. For an existing PSD source because of a criteria air pollutant, a major modification for greenhouse gases is an increase of 75,000 tons per year of carbon dioxide equivalent or more;
4. For an existing non-PSD source that has the potential to emit 100,000 tons per year of carbon dioxide equivalent emissions or more, a major modification for greenhouse gases is an increase of 75,000 tons per year of carbon dioxide equivalent or more; and

5. In addition to subsection (2) and (4), a specific greenhouse gas, without calculating the carbon dioxide equivalent, also needs to emit greater than 100 or 250 tons per year, whichever is applicable, to be regulated.

4.1 Potential to Emit Based on Short Term Limits

DENR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant's application, or other methods to determine potential air emissions.

The current permit contains enforceable permit conditions to ensure actual emissions from the ethanol plant do not exceed the major source threshold under the PSD program. Prairie Ethanol has short term emission limits that restrict the facility's potential emissions to less than 95 tons per year for criteria air pollutants. The permit also contains a plant wide emission limit for each criteria air pollutant of 95 tons per 12-month rolling total. Table 4-1 lists Prairie Ethanol's short term emission limits as taken from section 7.0 of the current permit.

Table 4-1 – Prairie Ethanol's Short Term Emission Limits

Unit	Description	Control	PM10	NOx	VOC	CO
			(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/hr)
#1	Grain receiving	Baghouse	0.8			
#2	Grain cleaning	Baghouse	0.09			
#3	Hammer mill #1	Baghouse	0.41			
#4	Hammer mill #2	Baghouse	0.41			
#5	Hammer mill #3	Baghouse	0.41			
#6	Hammer mill #4	Baghouse	0.41			
#7	Fermentation and distillation	Wet scrubber			17.6	
#8	Dryers, centrifuges, fermentation, and distillation	Regenerative thermal oxidizer	6.5	11.0	5.4	11.19
#9	Fluid bed cooler	Baghouse	1.1		7.3	
#10	Dried distillers grain and solubles storage silo	Baghouse	0.14			
#11	Dried distillers grain and solubles storage silo bypass	Baghouse	0.14			
#12	Boiler #1		1.1	4.72	0.8	5.0
#13	Boiler #2		1.1	4.72	0.8	5.0
#14	Generator		0.5	40.7	1.0	50.2
#23	Hammer mill #5	Baghouse	0.41			

In addition to the short term and long term limits, Prairie Ethanol accepted operational limits that restrict the operation of certain units. Table 4-2 provides a summary of the operational limits.

Table 4-2 – Operational Limits

Unit	Description	Operational Limit
#7	Fermentation and distillation	Bypass the thermal oxidizer associated with Unit #8 up to 500 hours per 12-month rolling period
#9	Fluid bed cooler	Exhaust gas stream from the fluid bed cooler used as sole combustion air source for the dryers associated with Unit #8 at all times dryers and fluid bed coolers are both in operation
#12	Boiler #1	Burn up to 1,127 million cubic feet of natural gas per 12-month rolling period
#13	Boiler #2	Burn up to 1,127 million cubic feet of natural gas per 12-month rolling period
#14	Generator	Operate less than or equal to 350 hours per 12-month rolling period
#16	Ethanol load out	Load out limit when flare is not operating of 1,500,000 gallons of denatured ethanol per 12-month rolling period.
	Plant wide	Ethanol production limited to 76 million gallons of undenatured ethanol per 12-month rolling period.
		Pave haul roads and parking lots

Table 4-3 summarizes the potential emissions from the permitted units under the short term and operational limits. Potential emissions for each applicable pollutant are calculated from the maximum design capacity listed in the application, the short term emission limits in Table 4-1, operational limits in Table 4-2, and assuming the unit operates every hour of every day of the year (8,760 hours per year), except where noted in Table 4-2.

Table 4-3 –Potential Controlled Emissions

Unit	Description	PM10 (tons/year)	NO _x (tons/year)	VOC (tons/year)	CO (tons/year)
#1	Grain receiving	3.5			
#2	Grain cleaning	0.4			
#3	Hammer mill #1	1.8			
#4	Hammer mill #2	1.8			
#5	Hammer mill #3	1.8			
#6	Hammer mill #4	1.8			
#7	Fermentation and distillation			4.4	
#8	Dryers, centrifuges, fermentation, and distillation	28.5	48.2	23.7	49.0
#9	Fluid bed cooler	4.8		32.0	
#10	Dried distillers grain and solubles storage silo	0.6			
#11	Dried distillers grain and solubles storage silo bypass	0.6			
#12	Boiler #1	4.3	18.6	3.2	19.7
#13	Boiler #2	4.3	18.6	3.2	19.7

Unit	Description	PM10	NO _x	VOC	CO
		(tons/year)	(tons/year)	(tons/year)	(tons/year)
#14	Generator	0.1	6.7	0.2	0.7
#16	Truck load out (flare)	0.0	0.2	¹	1.1
#17	Railcar load out			15.0	
#18	Tank #1			0.3	
#19	Tank #2			0.3	
#20	Tank #3			0.2	
#21	Tank #4			0.2	
#22	Tank #5			0.8	
#23	Hammer mill #5	1.8			
Fugitive	Equipment leaks			9.3	
Facility Emissions		56	92	93	90

¹ – The potential controlled emissions are greater if the railcar load out is used than the truck load out with a flare. Therefore, all the denatured ethanol was assumed to be loaded out by railcar.

DENR assumed the particulate matter less than or equal to 2.5 microns in diameter (PM2.5) emissions are equivalent to the PM10 emission rates. Therefore, the PM2.5 potential to emit will be less than the major threshold under the PSD program. DENR will place PM2.5 short term and long term limits in the Title V air quality operating permit.

Prairie Ethanol is not requesting any changes to the short term, long term, or operational limits. The plant wide limits in the existing permit will maintain Prairie Ethanol's potential to emit below 95 tons per year for criteria air pollutants.

4.2 Compliance with Short Term Limits

Table 4-4 provides a summary of the most recent stack test for the applicable permitted units and pollutant.

Table 4-4 – Summary of Stack Test Results

Date	Unit	Pollutant	Results	Notes
07/06/11	#14	NO _x	6.5 grams/hp-hr	Methods 3A, 7E and 10
		CO	0.66 grams/hp-hr	Methods 3A, 7E and 10
06/15/11	#12	NO _x	0.029 pounds/MMBtus	RATA test results
	#13	NO _x	0.026 pounds/MMBtus	RATA test results
03/14/07	#7	VOC	6.42 pounds/hour	Method 25A, scaled
		HAPs	1.22 pounds/hour	Method 18
	#11	PM	0.057 pounds/hour	Method 5
01/30/07	#1	PM	0.13 pounds/hour	Method 5
	#2	PM	0.008 pounds/hour	Method 5
	#3	PM	0.03 pounds/hour	Method 5
	#8	PM	1.45 pounds/hour	Method 5

Date	Unit	Pollutant	Results	Notes
		NOx	6.23 pounds/hour	
		CO	8.94 pounds/hour	
		VOC	2.21 pounds/hour	Method 25A, scaled
		HAPs	0.45 pounds/hour	Method 18
	#9	PM	0.22 pounds/hour	Method 5
		VOC	3.92 pounds/hour	Method 25A, scaled
		HAPs	0.16 pounds/hour	Method 18
	#12	NOx	4.28 pounds/hour	
			0.034 pounds/MMBtus	
		CO	1.89 pounds/hour	
	#13	NOx	3.63 pounds/hour	
			0.029 pounds/MMBtus	
		CO	2.39 pounds/hour	

Table 4-5 compares the stack test results to the short term limits.

Table 4-5 – Comparison of Stack Test Results to Short Term Limits

Unit	Pollutant	Short Term	Stack Test	In Compliance
#1	PM	0.8 pounds/hour	0.1 pounds/hour	Yes
#2	PM	0.09 pounds/hour	0.01 pounds/hour	Yes
#3	PM	0.41 pounds/hour	0.03 pounds/hour	Yes
#4 ¹	PM	0.41 pounds/hour	0.03 pounds/hour	Yes
#5 ¹	PM	0.41 pounds/hour	0.03 pounds/hour	Yes
#6 ¹	PM	0.41 pounds/hour	0.03 pounds/hour	Yes
#7	VOC	17.6 pounds/hour	6.4 pounds/hour	Yes
#8	PM	6.5 pounds/hour	1.5 pounds/hour	Yes
	NOx	11.0 pounds/hour	6.2 pounds/hour	Yes
	CO	11.19 pounds/hour	8.94 pounds/hour	Yes
	VOC	5.4 pounds/hour	2.2 pounds/hour	Yes
#9	PM	1.1 pounds/hour	0.2 pounds/hour	Yes
	VOC	7.3 pounds/hour	3.9 pounds/hour	Yes
#10 ²	PM	0.14 pounds/hour	0.06 pounds/hour	Yes
#11	PM	0.14 pounds/hour	0.06 pounds/hour	Yes
#12	NOx	4.72 pounds/hour	4.28 pounds/hour	Yes
	CO	5.0 pounds/hour	1.9 pounds/hour	Yes
#13	NOx	4.72 pounds/hour	3.63 pounds/hour	Yes
	CO	5.0 pounds/hour	2.4 pounds/hour	Yes
#14	NOx	40.7 pounds/hour	38.4 pounds/hour	Yes
	CO	50.2 pounds/hour	3.9 pounds/hour	
#23 ¹	PM	0.41 pounds/hour	0.03 pounds/hour	Yes

¹ – Compliance based on stack test results for Unit #3; and

² – Compliance based on stack test results for Unit #11.

The stack test results from Unit #3 were used to verify compliance with the short term limits for Unit #4, #5, #6, and #23. The stack test results from Unit #11 were used to verify compliance with the short term limit for Unit #10. Stack testing to determine compliance with the particulate matter and volatile organic compound short term limits for Unit #12 and #13 have not been conducted in the past.

4.3 Potential to Emit for Greenhouse Gases

Prairie Ethanol is considered an existing non-PSD source due to the operational limits in their existing Title V air quality operating permit. The next step is to determine if Prairie Ethanol has the potential to emit 100,000 tons per year of carbon dioxide equivalent emissions or more. There are six regulated greenhouse gases which are listed below:

1. Carbon dioxide;
2. Nitrous oxide;
3. Methane;
4. Hydrofluorocarbons;
5. Perfluorocarbons; and
6. Sulfur hexafluoride.

The two boilers are limited to combust 1,127 million cubic feet of natural gas per 12-month rolling period per boiler. The greenhouse gas emission factors for firing these units with natural gas are from AP-42, Table 1.4-2, July 1998 and are listed below:

1. Carbon dioxide = 120,000 pounds per million cubic feet;
2. Nitrous oxide = 2.2 pounds per million cubic feet;
3. Methane = 2.3 pounds per million cubic feet.

Using Equation 4-1, the appropriate emission factors and operating rates were used to determine the potential greenhouse gas emissions from the two boilers. In the case of the greenhouse gases, the result of Equation 4-1 needs to be multiplied by 1, 310, and 21 for carbon dioxide, nitrous oxide, and methane, respectively, to convert the results to carbon dioxide equivalent. The potential emissions for the greenhouse gases are summarized in Table 4-6.

Equation 4-1 – Potential emissions from thermal oxidizers

$$Potential \left(\frac{tons}{yr} \right) = 1,127 \left(\frac{MMcf}{year} \right) \times Emission\ Factor \left(\frac{lbs}{MMcf} \right) \div 2,000 \frac{lbs}{ton}$$

Table 4-6 – Thermal Oxidizer Greenhouse Gas Potential Emissions

Pollutant	Potential Emissions	Potential Carbon Dioxide Equivalent
Carbon Dioxide	67,620 tons per year per boiler	67,620 tons per year per boiler
Methane	1.2 tons per year per boiler	26 tons per year per boiler
Nitrous Oxide	3 tons per year per boiler	401 tons per year per boiler
Total		136,094 tons per year

Not considering any other greenhouse gas emissions from other sources, Prairie Ethanol is considered an existing non-PSD source with the potential to emit greater than 100,000 tons per year of carbon dioxide equivalent emissions. Therefore, Prairie Ethanol is considered a major source for greenhouse gases under the PSD program and future proposed changes will have to be reviewed to determine if they would be considered a major modification under the PSD program.

5.0 National Emission Standards for Hazardous Air Pollutants

DENR reviewed 40 CFR Part 61 to determine the applicability to this facility to any of the subparts and determined the following may be applicable.

5.1 Standards for Benzene Waste Operations

Previously, DENR considered a few ethanol plants applicable to 40 CFR, Part 61, Subpart FF. The applicability was primarily based on ethanol plants being considered a chemical processing plant based on its Standard Industrial Classification Code 2869 – Industrial Organic Chemicals – Not Elsewhere Classified.

In a May 1, 2007, federal register notice, EPA finalized a rule that identified ethanol plants were not considered chemical processing plants. Therefore, a more detailed review of applicability to this rule will be conducted. The May 1, 2007, federal register notice finalizes proposed changes to the definition of “major emitting facility” in the Prevention of Significant Deterioration (PSD), Nonattainment New Source Review (NSR) and Title V air quality operating permit regulations in regards to what facilities are considered a chemical processing facility. This notice identifies the change does not affect applicability for other clean air act requirements. In particular EPA notes on page 24067 that “The applicability of differing rules is standard-specific and determinations were made under individual rulemakings and will not be changed under this rulemaking. There is no directive for the applicability to be the same across CAA programs and standards and applicability determinations need to be determined on a case-by-case, or standard-by-standard, basis.”

However, EPA does note two specific items in this rule making: 1) On page 24063, EPA specified that it “did not believe that the term “chemical process plant” is subject to a “plain meaning interpretation.” There is not a universally accepted definition of chemical process, and accepted definitions differ depending on whether you view the term from a purely scientific sense or from an engineering sense, or for economic purposes.”; and 2) EPA specifies several new source performance standards and national emission standards for hazardous air pollutants that were potentially applicable to an ethanol plant. However, 40 CFR, Part 61, Subpart FF –

National Emission Standard for Benzene Waste Operations, was not one of the listed standards that were considered potentially applicable to an ethanol plant.

The provisions 40 CFR, Part 61, Subpart FF – National Emission Standard for Benzene Waste Operations, applies to chemical manufacturing plants, coke byproduct recover plants, and petroleum refineries. Chemical manufacturing means any facility engaged in the production of chemicals by chemical, thermal, physical, or biological processes for use as a product, co-product, by-product, or intermediate including but not limit to industrial organic chemicals, organic pesticide products, pharmaceutical preparations, paint and allied products, fertilizers, and agricultural chemicals. Examples of chemical manufacturing plants include facilities at which process units are operated to produce one or more of the following chemicals: benzenesulfonic acid, benzene, chlorobenzene, cumene, cyclohexane, ethylene, ethylbenzene, hydroquinone, linear alkylbenzene, nitrobenzene, resorcinol, sulfolane, or styrene.

Ethanol is a chemical that is produced by a biological process (fermentation). However, ethanol is not one of the listed chemicals specified by definition. Therefore, just by the definition does not appear to be conclusive. So a more detailed review of the background of the rule is necessary.

In EPA's September 14, 1989, federal register proposed rulemaking notice, EPA stated that "Although EPA's analyses focus on chemical plants, petroleum refineries, coke by-product recovery plants, and commercial TSDF's, any standards placed on benzene waste operations would be applicable to any waste containing benzene." In EPA's December 15, 1989, federal register proposed rule clarification notice, EPA stated that "The proposed rule is intended to apply only to benzene wastes from chemical plants, petroleum refineries, coke by-product recovery plants, and commercial hazardous waste treatment, storage, and disposal facilities. Coverage of these industry categories is consistent with the background information used as the basis for the proposed rule". In addition, in EPA's March 5, 1992, federal register proposed rule notice, EPA state that "In the analysis performed to support the development of subpart FF, EPA determined that the NESHAP risk protection goals could be exceeded if benzene emissions from benzene waste operations were not controlled. Rather than require all facilities to install controls, EPA structured the applicability criteria of the rule in a way that would identify that subset of facilities where controls were needed." The preambles indicate EPA intended for all benzene waste streams at all chemical manufacturing facilities to be covered by this regulation.

However, this doesn't specify what is considered a waste or a benzene waste stream. In accordance with 40 CFR § 61.341, waste is defined as "any material resulting from industrial, commercial, mining, or agricultural operations that is discarded or is being accumulated, stored or physically, chemically, thermally, or biologically treated prior to being discarded, recycled or discharged." In accordance with 40 CFR § 61.341, waste stream is defined as "the waste generated by the particular process unit, product tank, or waste management unit.... Examples of a waste stream include process wastewater, product tank drawdown, sludge and slop oil removed from waste management units, and landfill leachate."

The ethanol production process does not produce benzene. To transport the ethanol, ethanol plants are required by the United States Bureau of Alcohol, Tobacco, Firearms and Explosives to

add gasoline to its product. The purchased gasoline may contain small quantities of benzene. 100% ethanol and gasoline are initially stored in separate storage tanks. The 100% ethanol and gasoline are mixed together generally at a ratio of 19 to 1 (i.e. 95% ethanol and 5% gasoline) to produce denatured ethanol and are stored in a storage tank. The denatured ethanol is then loaded into railcars or trucks to be shipped offsite.

As noted in the March 7, 1990, federal register, the sources of benzene waste the rule was based on at chemical plants are as follows: “Wastes that contain benzene are generated from raw materials, intermediates, and products that contain benzene at ... chemical plants that use or produce benzene... Certain chemical plants use benzene as a raw material or produce it as a product or as a co-product or by-product in processes that involve direct-contact with steam or cooling water. These processes generate wastewater, sludge, and organic liquid wastes that contain benzene.” Based on the summary on the sources of benzene waste, ethanol plants do not meet the identified sources.

Gasoline or denatured ethanol, which includes amounts of benzene, would not be considered to meet this NESHAP’s definition of waste until it is “discarded”. For this to occur at an ethanol plant there would need to be a leak or a spill of the storage tanks or pipes between the tanks and loading racks. Upon collection of the gasoline or denatured ethanol from a spill, the material would then be classified as “remediation waste.” However, remediation wastes are excluded from a facility’s total annual benzene (TAB) calculation by this NESHAP to encourage facilities with a TAB less than 10 megagrams (10 tons) per year to undertake voluntary remediation actions.

The leak or spill of a storage tank would be maintained within a confined area. The leak or spill could then come into contact with rainwater to form an aqueous waste stream. However as noted in 40 CFR § 61.341, a stormwater waste stream is exempt from the standard. In addition as noted in the March 7, 1990, federal register, “Benzene in stormwater would result on an intermittent basis when spills or leaks are entrained by rainwater that falls at the facility. Existing regulations related to spills under both the CWA and RCRA should minimize the amount of benzene available for entrainment by storm water runoff. Because of this and considering that storm water runoff waste streams occur intermittently, EPA believes that on an annual average basis, benzene emissions from storm water will not contribute significantly to overall risk due to benzene emissions at a facility. Therefore, segregated storm water runoff is specifically excluded from today's benzene rule.”

Even though Prairie Ethanol may be considered a chemical plant under this rule because of its standard industrial classification code, Prairie Ethanol is not applicable to this standard because of the following reasons:

1. Prairie Ethanol does not produce a chemical as listed in the rule;
2. Prairie Ethanol does not produce a waste stream identified in the rule making for chemical plants that rule was designed to cover;
3. Prairie Ethanol potential benzene waste is either specifically exempt from the rule or is exempt from inclusion in the TAB calculation to determine if controls are necessary; and

4. EPA did not identify this regulation as being applicable in other rule makings or in its enforcement documents for ethanol plants.

5.2 Other NESHAP Standards

DENR reviewed the other national emission standards for hazardous air pollutants and determined there are no other standards applicable to this ethanol plant.

6.0 Maximum Achievable Control Technology Standards

6.1 Potential HAP Emissions

The federal Maximum Achievable Control Technology Standards are applicable to both major and area sources of hazardous air pollutants. A major source of hazardous air pollutants is defined as having the potential to emit 10 tons or more per year of a single hazardous air pollutant or 25 tons per year or more of a combination of hazardous air pollutants. An area source is a source that is not a major source of hazardous air pollutants.

DENR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant's application, or other methods to determine potential air emissions.

Prairie Ethanol accepted operational limits to ensure their potential to emit does not exceed the major source threshold under the Title V air quality operating permit program for hazardous air pollutants. Table 6-1 provides a summary of hazardous air pollutant emissions based on the operational limits Prairie Ethanol accepted to avoid the Prevention of Significant Deterioration program.

Table 6-1 –Potential Controlled Emissions for Hazardous Air Pollutants

Unit	Description	Potential Controlled Emissions
#7	Fermentation and distillation	0.3 tons/year ¹
#8	Dryers, centrifuges, fermentation, and distillation	2.0 tons/year ²
#9	Fluid bed cooler	0.7 tons/year ²
#12	Boiler #1	1.2 tons/year
#13	Boiler #2	1.2 tons/year
#14	Generator	0.0
#16	Truck load out (flare)	³
#17	Railcar load out	0.2 tons/year
#22-#26	Tank #1 through #5	0.1 tons/year
Total		6 tons/year

¹ – The potential emissions from Unit #7 is based on the March 14, 2007 stack test and the operational limit that exhaust gases from Unit #7 can only flow through Unit #7's stack for 500 hours per 12-month rolling period;

² – The potential emissions are based on the March 14, 2007 stack test and assuming the units operate 8,760 hours per year;

³ – The potential controlled emissions are greater if the railcar load out is used than the truck load out with a flare. Therefore, all the denatured ethanol was assumed to be loaded out by railcar.

DENR reviewed the Maximum Achievable Control Technology Standards and determined the following may be applicable to Prairie Ethanol.

6.2 Industrial Process Cooling Towers

The national emission standard for industrial process cooling towers in 40 CFR Part 63, Subpart Q prohibits the use of chromium based water treatment chemicals in industrial process cooling towers. Prairie Ethanol uses two cooling towers in its operation. Since the compliance date for existing sources has passed, this rule does not apply provided no chromium based water treatment chemicals are used. If they are used, the source is in violation of this federal requirement.

In accordance with ARSD 74:36:05:04.01(8), a unit cannot be considered insignificant if a state or federal limit is applicable to the unit. The prohibition of chromium based water treatment chemicals is a limit. Therefore, the industrial process cooling tower cannot be considered insignificant activities and will be included in the permit.

6.3 Chemical Processing Plants

On November 10, 2003, EPA finalized the maximum achievable control technology standard under 40 CFR Part 63, Subpart FFFF. This rule applies to the following chemical processing plants:

1. Those facilities that produce chemicals classified using the 1987 Standard Industrial Classification Manual of a code indicated by 282, 283, 284, 285, 286, 287, 289, or 386; and
2. Those facilities that are a major source of hazardous air pollutants. A major source of hazardous air pollutants has the potential to emit 10 tons of a single hazardous air pollutant and/or 25 tons of all hazardous air pollutants;

Prairie Ethanol's Standard Industrial Classification code is 2869, which falls underneath the code of 286. Prairie Ethanol requested operational restrictions that maintain hazardous air pollutant emissions less than the major source threshold under the Title V air quality operating permit program. Taking this into account, Prairie Ethanol is not applicable to this maximum achievable control technology standard.

6.4 Stationary Reciprocating Internal Combustion Engines

40 CFR Part 63, Subpart ZZZZ establishes national emission and operating limitations for hazardous air pollutants emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of hazardous air pollutant emissions. A stationary RICE is any internal combustion engine which uses reciprocating motion to convert heat energy into mechanical work and which is not mobile. Unit #14 (generator) is considered a stationary RICE engine.

According to 40 CFR § 63.6590(a)(1)(iii), a stationary RICE at an area source is existing (and subject to this subpart) if it commenced construction or reconstruction of the stationary RICE before June 12, 2006. This subpart states construction is defined as the date the generator was ordered.

Prairie Ethanol operates a Caterpillar, Model 3516B, 2,000 kilowatt (2,680 horsepower) generator. The generator has a displacement of 69 liters and 16 cylinders which equates to 4.3 liters per cylinder. According to the manufacturer, the unit was ordered (e.g., commenced construction) by Prairie Ethanol on October 5, 2005 and construction was completed on May 2, 2006. Therefore, the unit is subject to the requirements of this subpart.

Prairie Ethanol had requested the term “emergency” associated with the generator in permit condition 5.3, 5.4, and 6.8 be removed because it is not used just for emergencies. Prairie Ethanol has an agreement with an electric supply company to use the generator for additional power during peak demands which means the generator is a nonemergency generator. However, Prairie Ethanol notified DENR that the contract with the electric supply company will not be renewed and the generator will only be utilized as an emergency generator.

The generator is required to meet the requirements in this subpart applicable to an existing compression ignition generator at an area source of hazardous air pollutants with a site rating of more than 500 brake horsepower and a displacement of less than 10 liters per cylinder. Prairie Ethanol must comply with the applicable emission and operating limits no later than May 3, 2013.

6.5 Industrial, Commercial, and Institutional Boilers and Process Heaters

40 CFR Part 63, Subpart DDDDD establishes national emission and operating limits for hazardous air pollutants emitted from industrial, commercial, and institutional boilers and process heaters located at a major source of hazardous air pollutant emissions. Because of emission and operational limits, Prairie Ethanol is considered an area source of hazardous air pollutants and not subject to this subpart.

6.6 Area Source for Industrial, Commercial and Institutional Boilers

On March 21, 2011, EPA finalized the MACT standard under 40 CFR Part 63, Subpart JJJJJ. This rule applies to all new or existing industrial, commercial, and institutional boilers located at

an area source of hazardous air pollutants. An existing boiler is defined as a boiler where construction or reconstruction occurred prior to June 4, 2010.

Prairie Ethanol operates two boilers that were both constructed in 2006. Both boilers are rated at 143 million Btus per hour and are fired with natural gas only. The potential hazardous air pollutant emissions from Prairie Ethanol classify it as an area source of hazardous air pollutants.

In accordance with 40 CFR § 63.11195(e), a gas-fired boiler is exempt from the requirements of this subpart. A gas-fired boiler is defined as "...any boiler that burns gaseous fuels not combined with any solid fuels, burns liquid fuel only during periods of gas curtailment, gas supply emergencies, or periodic testing on liquid fuel." Gaseous fuels include natural gas. Therefore, Prairie Ethanol is not subject to this subpart provided natural gas is the only fuel burned in the two burners.

6.7 Other MACT Standards

DENR reviewed the other Maximum Achievable Control Technology Standards and determined there are no other standards applicable to this ethanol plant.

7.0 State Requirements

7.1 State Particulate Emission Limits

ARSD 74:36:06:02(1) and 74:36:06:03(1), establish state emission limits for total suspended particulate matter. In addition, ARSD 74:36:12:01 establishes a visible emission limit of 20 percent opacity for each unit.

In accordance with ARSD 74:36:06:01, a unit that must comply with a total suspended particulate matter emission limit under the New Source Performance Standards, Maximum Achievable Control Technology Standards, the Acid Rain Program, or the Prevention of Significant Deterioration Program is exempt from having to meet the state's total suspended particulate matter emission limits. In this case, the nonemergency generator (Unit #14) is applicable to a New Source Performance Standard that has a particulate matter limit and is exempt from the state's total suspended particulate matter emission limit.

In accordance with ARSD 74:36:06:02(1)(a), a fuel burning unit with heat input value less than 10 million Btus per hour may not exceed 0.6 pounds of particulate emissions per million Btu of heat input. Based on the heat input capacities of the permitted units, there are no units applicable to this total suspended particulate matter emission limit.

In accordance with ARSD 74:36:06:02(1)(b), a fuel burning unit with a heat input equal to or greater than 10 million Btus per hour heat input may not exceed the particulate emissions rate determined by Equation 7-1.

Equation 7-1 – Particulate Emissions Limit for Fuel Burning Units =

$$E_{TSP} = 0.811 \times H^{-0.131}$$

Where:

- E_{TSP} = emission rate, in pounds per million Btu heat input, and
- H = heat input, in million Btus per hour.

Unit #12 and #13 each have a heat input capacity greater than 10 million Btus per hour. Table 7-1 provides a maximum heat input value for each unit and the corresponding particulate emission limit. Table 7-4 provides a comparison of the state emission limit to the potential emissions to determine if the units are in compliance with the state emission limits.

Table 7-1 –Total Suspended Particulate Matter Emission Limit for Fuel Burning Units

Unit	Description	Maximum Heat Input	State Emission Limit
#12	Boiler #1	143 million Btus per hour	0.4 pounds per million Btus
#13	Boiler #2	143 million Btus per hour	0.4 pounds per million Btus

¹ – The maximum heat input value of 150 million Btus per hour is based on the maximum heat input for each dryer permitted at 60 million Btus per hour and the thermal oxidizer rated at 30 million Btus per hour.

The particulate emission limits for process units are derived from ARSD 74:36:06:03(1). Equation 7-2, taken from ARSD 74:36:06:03(1)(a), is used to calculate the state limit of particulate emissions for each process unit with operating rates less than or equal to 30 tons per hour. This state limit is applicable to Unit #3, #4, #5, #6, #8, #9, #10, #11, and #23. Table 7-2 provides a maximum process rate for each unit and the corresponding particulate emission limit. Table 7-4 provides a comparison of the state emission limit to the potential emissions to determine if the units are in compliance with the state emission limits.

Equation 7-2 – State Particulate Emission Limit for Process Units ≤ 30 tons per hour

$$E_{TSP} = 4.10 \times P^{0.67}$$

Where:

- E_{TSP} = Emission limit for total suspended particulate matter, in pounds per hour; and
- P = Design process rate, in tons per hour.

Table 7-2 –Total Suspended Particulate Matter Emission Limit for Processes

Unit	Description	Maximum Heat Input	State Emission Limit
#3	Hammer mill #1	22 tons per hour	32.5 pounds per hour
#4	Hammer mill #2	22 tons per hour	32.5 pounds per hour
#5	Hammer mill #3	22 tons per hour	32.5 pounds per hour
#6	Hammer mill #4	22 tons per hour	32.5 pounds per hour
#8	Dryers, centrifuges, fermentation, and distillation	23 tons per hour	33.5 pounds per hour
#9	Fluid bed cooler	23 tons per hour	33.5 pounds per hour
#10	Dried distillers grain and solubles storage silo	23 tons per hour	33.5 pounds per hour
#11	Dried distillers grain and solubles storage silo bypass	23 tons per hour	33.5 pounds per hour

Unit	Description	Maximum Heat Input	State Emission Limit
#23	Hammer mill #5	22 tons per hour	32.5 pounds per hour

Equation 7-3, taken from ARSD 74:36:06:03(1)(b), is used to calculate the state limit of particulate emissions for each process unit with operating rates greater than 30 tons per hour. This state limit is applicable to Unit #1 and #2. Table 7-3 provides a maximum process rate for each unit and the corresponding particulate emission limit. Table 7-4 provides a comparison of the state emission limit to the potential emissions to determine if the units are in compliance with the state emission limits.

Equation 7-3 – State Particulate Emission Limit for Process Units ≤ 30 tons per hour

$$E_{TSP} = 55.0 \times P^{0.11} - 40$$

Where:

- E_{TSP} = Emission limit for total suspended particulate matter, in pounds per hour; and
- P = Design process rate, in tons per hour.

Table 7-3 –Total Suspended Particulate Matter Emission Limit for Processes

Unit	Description	Maximum Heat Input	State Emission Limit
#1	Grain receiving	840 tons per hour	75.4 pounds per hour
#2	Grain cleaning	140 tons per hour	54.7 pounds per hour

Table 7-4 – State Total Suspended Particulate Matter Limit Compared to Stack Test Results

Unit	State Emission Limit	Stack Test Results	In Compliance
#1	75.4 pounds per hour	0.1 pounds per hour	Yes
#2	54.7 pounds per hour	0.01 pounds per hour	Yes
#3	32.5 pounds per hour	0.03 pounds per hour	Yes
#4	32.5 pounds per hour	0.03 pounds per hour	Yes
#5	32.5 pounds per hour	0.03 pounds per hour	Yes
#6	32.5 pounds per hour	0.03 pounds per hour	Yes
#8	33.5 pounds per hour	1.5 pounds per hour	Yes
#9	33.5 pounds per hour	0.2 pounds per hour	Yes
#10	33.5 pounds per hour	0.7 pounds per hour ¹	Yes
#11	33.5 pounds per hour	0.1 pounds per hour ¹	Yes
#12	57 pounds per hour	1.1 pounds per hour ¹	Yes
#13	57 pounds per hour	1.1 pounds per hour ¹	Yes
#23	32.5 pounds per hour	0.03 pounds per hour	Yes

¹ – Based on previous review of operations.

7.2 State Sulfur Dioxide Emission Limits

In accordance with ARSD 74:36:06:02(2) and ARSD 74:36:06:03(2), the permitted units may not emit sulfur dioxide emissions to the ambient air in an amount greater than three pounds of sulfur dioxide per million Btus of heat input. The sulfur dioxide emission limit is applicable to Unit #8, #12, #13, and #14.

In accordance with ARSD 74:36:06:01, a unit that must comply with a sulfur dioxide emission limit under the New Source Performance Standards, Maximum Achievable Control Technology Standards, the Acid Rain Program, or the Prevention of Significant Deterioration Program is exempt from having to meet the state's sulfur dioxide emission limit. In this case, the nonemergency generator (Unit #14) is applicable to a New Source Performance Standard and Maximum Achievable Control Technology Standard with a limit on the sulfur content in the fuel burned in the generator. Therefore, Unit #14 is exempt from the state's sulfur dioxide emission limit.

All three units are fired with natural gas. The sulfur content of natural gas is less than 0.01 pounds per million Btus.

7.3 Performance Tests

Prairie Ethanol conducted performance testing in 2007 to prove compliance with the currently permitted short-term limits. Table 7-6 summarizes the applicable test results.

Table 7-6 – Comparison of Short Term Limits and Stack Test Results

Unit	Pollutant	Short-Term Limit	Stack Test Results	Percentage of Short Term Limit
		(pounds/hour)	(pounds/hour)	
#1	PM10	0.8	0.1	13%
#2	PM10	0.09	0.01	11%
#3	PM10	0.41	0.03	7%
#4 ¹	PM10	0.41	0.03	7%
#5 ¹	PM10	0.41	0.03	7%
#6 ¹	PM10	0.41	0.03	7%
#7	VOC	17.6	6.4	36%
#8	PM10	6.5	1.5	23%
	NOx	11.0	6.2	56%
	CO	11.19	8.9	80%
	VOC	5.4	2.2	41%
#9	PM10	1.1	0.2	18%
	VOC	7.3	3.9	53%
#10 ²	PM10	0.14	0.06	43%
#11	PM10	0.14	0.06	43%
#12	NOx	4.72	4.28	91%
	CO	5.0	1.9	38%
#13	NOx	4.72	3.63	77%
	CO	5.0	2.4	48%
#23 ¹	PM10	0.41	0.03	7%

¹ – Percentage of short term limit based on stack test results for Unit #3; and

² – Percentage of short term limit based on stack test results for Unit #11.

POET requested the methodology to determine compliance with volatile organic compound (VOC) emission limits be based on POET's consent decree with EPA Region 8 regarding

another POET biorefinery located in South Dakota. EPA required POET to request a permit modification at its facilities to clarify the required test methodology when determining compliance with applicable volatile organic compound emission limits. POET is requesting the following permit language be included in the permit renewal regarding stack testing requirements:

1. Required Test Methods. The owner or operator shall conduct all volatile organic compound mass emission performance tests in accordance with 40 CFR Part 51, Appendix M, Method 207 and 40 CFR Part 60, Appendix A, Method 18;
2. Treatment of 2,3-Butanediol. Due to difficulties associated with appropriate method detection limit, 2,3-Butanediol will be sampled through the chromatography column approximately 2.5 times faster than the maximum allowable sampling rate for the other volatile organic compound in the sampling program (e.g. acetaldehyde, acrolein, and ethyl acetate). This requirement applies only if the Method 207 results indicate that 2,3-Butanediol should be sampled as part of the Method 18 testing;
3. Treatment of Non-Detects. When summing analytes per Method 18, non-detect data will be included in the total volatile organic compound mass as one half of the compound method detection limit; except that, if all three performance test runs result in a non-detect measurement and the method detection limit is less than or equal to 1.0 part per million by volume on a dry basis, then all such non-detect data will be treated as zero.

Based on the stack testing dates and the results compared to the short term limits and the new volatile organic compound testing methodology, DENR will require the following testing requirements as part of the proposed renewal:

1. Volatile organic compound testing on Unit #7, #8, and #9 using the new methodology;
2. Carbon monoxide testing on Unit #8; and
3. Nitrogen oxide testing on Unit #8, #12 and #13.

Unit #1 is also required to meet a 0.01 grains per dry standard cubic foot particulate emissions limit based on federal New Source Performance Standard requirements. The stack test that occurred on January 2007 resulted in a particulate emission rate of 0.0006 grains per dry standard cubic foot. Based on the stack test results, DENR believes additional testing is not warranted to demonstrate compliance with this particulate emission limit.

7.4 Compliance Assurance Monitoring

Compliance assurance monitoring is applicable to any unit at major sources applying for a Title V air quality operating permit that meets the following criteria:

1. The unit is subject to an emission limit or standard for the applicable regulated air pollutant;
2. The unit uses a control device to achieve compliance with any such emission limit or standard; and
3. The unit has potential uncontrolled emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source.

Prairie Ethanol is applying for a Title V air quality operating permit; but is not a major source under the Title V air quality operating permit program because it accepted operational limits to maintain potential emissions below the major source threshold. Therefore, compliance assurance monitoring is not required.

7.5 Periodic Monitoring

Periodic monitoring is required for each emission unit that is subject to an applicable requirement at a source subject to the Title V air quality operating permit program. The permitted units at this facility are required to meet opacity, particulate matter, sulfur dioxide, nitrogen oxide, carbon monoxide, operational limits, and limits applicable to the New Source Performance Standards and Maximum Achievable Control Technology Standards. Periodic monitoring will be based on the following:

1. Periodic monitoring for opacity will be based on periodic visible emission readings or evaluations. Periodic monitoring of particulate matter emissions will consist of visible emission readings and proper operation and maintenance of all pollution control devices.
2. Periodic monitoring of sulfur dioxide emissions for units burning natural gas is not required based on the sulfur content in pipeline quality natural gas.
3. Periodic monitoring of the nitrogen oxide emission limit for Unit #12 and #13 will be based on the requirements in the New Source Performance Standards. Periodic monitoring for the thermal oxidizer will be based on monitoring the temperature to ensure good combustion.
4. Periodic monitoring of the carbon monoxide emission limits will be based on good combustion practices.
5. Periodic monitoring of volatile organic compound emission limits will be based on recordkeeping, reporting, and leak checks in accordance with the New Source Performance Standards. Periodic monitoring for Unit #7 will be based on monitoring the water flow rate.

Periodic monitoring of the operational limit shall be based on recordkeeping and reporting requirements. The applicable limits in the New Source Performance Standards and Maximum Achievable Control Technology Standards will be based on the requirements in the applicable standard.

7.6 Air Fees

Sources subject to the Title V air quality operating permit program are subject to an annual air quality fee. The fee consists of an administrative fee and a per ton fee based on the actual tons per year of pollutant emitted. The pollutants charged for are particulate matter, sulfur dioxides, nitrogen oxides, volatile organic compounds, and hazardous air pollutants. The actual emissions are calculated by DENR based on operational information provided by the source.

8.0 Recommendation

Any source operating in South Dakota that meets the definition of a major source for any criteria pollutant is required to obtain a Title V air quality operating permit. A major source is defined as having the potential to emit greater than 100 tons per year of a criteria pollutant or greater than or equal to 10 tons per year of a single hazardous air pollutant, or greater than or equal to 25 tons per year of a combination of hazardous air pollutants. In addition, sources subject to federal New Source Performance Standards or national emission standards for hazardous air pollutants must obtain a Title V air quality operating permit, unless otherwise noted in the state or federal rule.

Prairie Ethanol accepted enforceable permit conditions to maintain its potential air emissions below the major source threshold under the Prevention of Significant Deterioration air quality preconstruction permit program. These enforceable permit conditions also maintain potential emissions below the major source threshold under the Title V air quality operating permit program. However, Prairie Ethanol is subject to several New Source Performance Standards and Maximum Achievable Control Technology Standards. Therefore, Prairie Ethanol is required to obtain a Title V air quality operating permit.

Based on the above findings, Prairie Ethanol is required to operate within the requirements stipulated in the following regulations:

1. ARSD 74:36:05 – Operating Permits for Part 70 Sources;
2. ARSD 74:36:06 – Regulated Air Pollutant Emissions;
3. ARSD 74:36:07 – New Source Performance Standards;
4. ARSD 74:36:08 – National Emission Standards for Hazardous Air Pollutants;
5. ARSD 74:36:11 – Stack Performance Testing; and
6. ARSD 74:36:12 – Control of Visible Emissions.

Based on the information submitted in the air quality permit application, DENR recommends conditional approval to renew Prairie Ethanol's Title V air quality operating permit. Any questions pertaining to this permit recommendation should be directed to Keith Gestring, Engineer II.